The Gender Context of Pain

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Abstract

Pain is a major source of global suffering, with women bearing the greatest burden. Alongside biology, psychological and social factors, including gender, help explain these differences. However, there has been no direct attempt to develop a unified social psychological model of men and women's pain. By drawing on approaches to both gender and pain, a gender context model of pain is presented. It proposes that pain is partly influenced by the gender context in which it occurs, which operates at both individual and interpersonal levels. The model is used to structure an appraisal of the existing evidence around gender and pain, and explore whether the model helps explain why such variation occurs. It is argued that despite evidence for an association between gender and pain, there are empirical gaps that need to be addressed. Implications and directions for future investigations into sex, gender and pain are considered.

Keywords: pain, gender, sex, masculinity, femininity, social context

The Gender Context of Pain

Pain is a global healthcare challenge, associated with long-term disability and reduced quality of life (Blyth & Huckel Schneider, 2018). Pain is a highly variable, subjective, experience that requires explanations to go beyond sensory tissue damage to fully understand it (Raja et al., in press; Williams & Craig, 2016). There are also sex and gender differences in pain, which accounts for some of this variation. Women are more sensitive to experimental pain, experience more pain across the lifespan, and live longer with pain-related disability (Fillingim, 2017; Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009). This increased burden occurs for many painful conditions, including lower back pain, fibromyalgia, headache, abdominal pain, and cancer-related pain. Interesting, age impacts on this variation, in that differences in pain are less consistently found in boys and girls but seem to emerge in adolescence, and continue through adulthood and older age (Boerner, Birnie, Caes, Schinkel, & Chambers, 2014; Gobina et al., 2018; King et al., 2011; LeResche, 2013; Tsang et al., 2008).

Men and women also differ in the way they respond to pain. For example, women consume more analgesics, consult more often for health conditions, and are more likely to attend pain clinics (Bondesson, Olofsson, Caverius, Schelin, & Joud, 2020; Mahic, Fredheim, Borchgrevink, & Skurtveit, 2015; Paulose-Ram et al., 2003). There are also differences in treatment responses to pharmacological interventions for pain, including a greater vulnerability to side effects in women (Niesters et al., 2010; Planelles et al., 2020). Unfortunately, there are fewer investigations that focus on differences in how men and women respond to non-pharmacological treatments, with somewhat mixed findings reported (Boerner, Eccleston, Chambers, & Keogh, 2017; Keogh, McCracken, & Eccleston, 2005; Racine et al., 2020). Even so, these potential differences in treatment outcomes suggest a need to consider whether specific treatments for men and women's pain should be developed.

Taken together, pain is clearly an important health condition, which particularly affects women. Whilst pain can be viewed as a diagnosable disease in its own right, it is also a symptom that underpins many long-term chronic conditions (Treede et al., 2019). Pain, therefore, provides us with a unique opportunity to not only explore and better understand the role that sex and gender have in pain, but also provide us with insights into the role these variables might have across a wide range of chronic conditions.

Explanations for the Variation in Pain in Men and Women

Much of our understanding as to why men and women differ in their experience of pain is based on the discovery of biological mechanisms that mediate the variation in pain and analgesia. A key focus has been on sex hormones, which affect a range of brain and bodily functions (Berenbaum & Beltz, 2016; Fillingim et al., 2009; McEwen & Milner, 2017; Nasser & Afify, 2019). Evidence supporting this view stems from observations that pain sensitivity changes as hormonal status changes, such as menstrual phase, puberty, menopause. For example, changes in experimental pain sensitivity (e.g., threshold, tolerance) are related to changes across the menstrual cycle. A meta-analysis found that the follicular phase of the menstrual cycle (i.e., lower oestrogen) is associated with higher thresholds for some type of induced pain (Riley, Robinson, Wise, & Price, 1999). Menstrual phase also affects those with clinical pain, moderating experimental pain responses and clinical pain symptoms (LeResche, Mancl, Sherman, Gandara, & Dworkin, 2003; Ribeiro-Dasilva et al., 2011). However, the effects of oestrogen on pain are complex, in that mixed effects are found, whereas testosterone seems to have a protective effect (Bartley & Fillingim, 2013; Craft, Mogil, & Aloisi, 2004; Fillingim et al., 2009). For example, a study on women with fibromyalgia found that increases in testosterone and progesterone, but not oestrogen, across the menstrual cycle were associated with reduced pain sensitivity (Schertzinger, Wesson-Sides, Parkitny, & Younger, 2018).

As well as sex hormones, other biological mechanisms seem to mediate variation in men and women's pain, including genetics (Mogil et al., 2003), nervous system (Gupta et al., 2017; Popescu, LeResche, Truelove, & Drangsholt, 2010), and immune system functioning (Sorge & Totsch, 2017). For example, a review by Gupta et al. (2017), of brain imaging studies across different chronic painful conditions, found women exhibited more primary sensorimotor alternations than men. Sex differences in descending spinal control of pain have also been reported, with men showing greater inhibition compared to women (Popescu et al. 2010). Furthermore, pre-clinical studies suggest potential immune-hormone interactions mediate male-female variation in pain sensitivity (Sorge & Totsch, 2017). Whether this translates to human pain is a current area of investigation.

Collectively, this work suggests that biology plays a role in explaining some of the differences in men and women's pain. Biological approaches point to the need to not only explain the variation that occurs *between* men and women, but also the variation that occurs *within* the sexes. These studies highlight that biological determinants of male and female pain are complex and multifaceted, and may interact with each other. They also highlight gaps in knowledge, as findings can be mixed. Interestingly, reviews of biological sex differences recognise this, and note that a full explanation for the variation in men and women's pain requires us to consider psychological and social determinants as well (Nasser & Afify, 2019; Sorge & Totsch, 2017). Here, there is a need to understand the broader set of social psychological factors that contribute to, and maintain, pain and pain-related disability.

Of the various social psychological determinants known to affect pain, gender is often used to highlight the impact that socially learnt roles have on pain and pain behaviours. Like biology, gender is also multifaceted, and is often used as shorthand for a complex collection of constructs (Bernardes, Keogh, & Lima, 2008; Boerner et al., 2018; Keogh, 2018). Whilst different gender constructs have been explored to varying degrees in the context of pain, this

work has not yet been brought together in a coherent manner. Indeed, no gender-based model of pain currently exists that seeks to explain how gender constructs collectively help to explain men and women's pain. Furthermore, sex and gender are largely absent from most of the main social psychological models of pain. Fortunately, outside of pain research, there have been significant conceptual developments around gender and gender constructs that could translate well to pain (Bernardes et al., 2008; Boerner et al., 2018).

The primary goal of this article is therefore to consider these different approaches to gender, generate a new model of gender and pain, and bring the existing evidence together in a more structured way. While the focus here will be on gender, and social psychological factors, this is not meant to imply biology is irrelevant. After all, just as gender raises issues (e.g., social context) that can inform those working on biological sex differences, biology (e.g., organisational-activational role of sex hormones) helps inform those interested in gender (Berenbaum & Beltz, 2016; Holmes & Monks, 2019; Hyde, Bigler, Joel, Tate, & van Anders, 2018; Polderman et al., 2018). Also, the focus on either biological or social psychological mechanisms may lead to a focus on different pain outcomes, limiting explanations e.g., nociception vs. socially learnt pain behaviours.

This article should also be of interest to those working more broadly in gender, and outside the field of pain. There are similar themes and challenges that could translate across disciplines. For example, like gender, pain can be conceptualised as an embodied experience (Tabor, Keogh, & Eccleston, 2017). Pain psychology has well developed behavioural concepts and methods (e.g., threat detection, goal motivation) that could be used to explore gender and gendered behaviours. A key challenge is how to integrate multiple, interacting, biological, psychological and social influences into our understanding of pain (Fillingim, 2017; Raja et al., in press).

Defining Gender and Gender-related Constructs

Defining sex and gender

Both sex and gender can be used to refer to the variation that occurs within and between men and women, and reflect a multitude of biological, psychological and socio-cultural influences (CIHR Institute of Gender and Health, 2012). Sex is often used when there is a focus on biological factors, such as chromosomes, hormones and reproductive structures; and gender when reflecting on socially constructed and learnt aspects. However, caution should be used in simply equating sex with biology, and gender with social psychological mechanisms, as it implies biological and psychosocial influences are separate, despite evidence for overlap (Hyde et al., 2018; Morgenroth & Ryan, in press). There is also further confusion with the term gender, as it can be used categorically (e.g., gender binary), but also to refer to a range of dimensional constructs. As noted by Boerner et al. (2018), the definition proposed by the Canadian Institutes of Health Research Institute of Gender and Health (2012) helpfully illustrates this complexity. It states, "Gender refers to the socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people. It influences how people perceive themselves and each other, how they act and interact, and the distribution of power and resources in society".

For the purposes of this article, the term sex will be used when referring to binary (categorical) comparisons between men and women, and without any presumption of biological, psychological or social mechanisms. It is acknowledged that there are alternative terms that could be used to refer to binary comparisons (e.g., gender/sex binary). However, the term gender will be used here when referring specifically to dimensional gender-related constructs. Given the complexities of gender, there is also a need to have clear definitions of the core constructs involved.

Defining gender constructs: beyond binary categories

Gender identity: Self-identity generally refers to the thoughts and feelings a person has about themselves, and who they are. Self-identity is multifaceted, in that individuals possess a range of identities that come into play in various situations e.g., parent, employee, friend. For some, one important aspect of self-identity is gender, which refers to an individual's sense of self in relation to the gender they most strongly associate with (Hyde et al., 2018; Wood & Eagly, 2015). Gender identity can be the same as the binary male-female category an individual is assigned at birth (e.g., cis–identified individuals), but is not necessarily limited or fixed to this (e.g., transgender, gender non-conforming, individuals).

There are various ways in which gender identity can therefore be conceptualised and explored. Rather than adopting one view, this article will take a more general approach, and follow the position outlined by Wood and Eagly (2015). They suggest that there are at least two general approaches, each with merits, but which reflect different ways of exploring gender identity. In one, gender identity is seen as a personal, individual, experience, usually reflected in a set of attributes or traits that map onto stereotypical gender roles (e.g., Bem, 1974). In the other, gender identity is viewed in terms of how closely one identifies with, or feels they belong to, particular social groupings e.g., men, women (Ellemers, Spears, & Doosje, 2002). These approaches often conceptualise gender identity around the constructs of masculinity and femininity, with masculinity used to describe behaviours associated with agency/control (e.g., stoicism, independence), and femininity with communion and sociability (e.g., emotionally expressive, caring). Both masculinity and femininity can be framed around stereotypical gender roles, with men typically assigned masculine characteristics, and women feminine characteristics. However, masculinity and femininity are also thought to co-exist within individuals, and whilst some may conform to stereotypical

gender roles, this can be more nuanced, allowing for individual variation. And for some, gender simply does not form a key part of their identity.

*Gender beliefs and expectations***:** People are also thought to have a range of different gender-based beliefs and expectations, which can not only affect how they view their own behaviour, but also the behaviour of others. Some beliefs are based on socially constructed gender stereotypes, often reflecting wider gender norms, which are the shared informal rules that relate to how people are expected to behave (Ellemers, 2018). For example, stereotypical masculine beliefs might reflect norms about men not appearing feminine, being stoic/less emotional, and needing high status roles (Thompson & Bennett, 2015). Of particular relevance to pain, is that gender beliefs can include beliefs about the body, and can affect how (healthy) bodies are viewed (Markey et al., 2020; Saltonstall, 1993). For example, gender stereotypes around the 'ideal' masculine and feminine body have been linked to body dysphoria, and can lead to the adoption of potentially harmful behaviours that are thought to meet a body ideal e.g., eating disorders, steroid use.

Gender behaviours and situational context: The way a person communicates gender is often referred to as gender expression. It can include a person's appearance as well as the way they behave, and may or may not conform to their gender identity. Behaviours and social interactions can themselves be viewed as 'gendered', with concepts such as 'doing gender' and 'undoing gender' reflecting how people perform different forms of gender (Butler, 1990; West & Zimmerman, 1987). This view also highlights that multiple versions of masculinity and femininity exist, which vary according to situation, time and circumstances (Connell, 1995; Schippers, 2007). From this gender can also be viewed as fluid and contextually dependent (Wood & Eagly, 2015); as transactional, social negotiated, varying moment-by-moment, as behaviour is shaped by the validating or punishing behaviours of others. Gender expression can be affected by the social context in which people find themselves in, in that

gendered behaviours are more likely to occur (or be triggered) when situational cues are aligned with trait concerns (Deaux & Major, 1987).

Socio-cultural gender context: Themes of power and dominance are explored, placing different forms of gender within a socio-cultural hierarchy. These themes can be seen in sociological and political approaches to gender, which focus on its social function. For example, terms such as hegemonic masculinity are used to reflect culturally dominant Western views around the ideal 'male', and which values men, and certain 'male roles', over others (Connell, 1995). Hegemonic femininity reflects views of the ideal female, which reinforce masculinity by promoting women's subordination, emotionality, caring and vulnerability (Schippers, 2007). These views draw on the wider social context, where gender intersects with other groups (e.g., ethnicity, social class), and reflects different social, cultural, and historical contexts.

Gender development: Understanding how gender identity, as well as gender beliefs and behaviours, develop is also of interest, and is relevant to pain. Early childhood experiences and interactions are thought to shape the way gender constructs develops, with socio-cultural factors continuing to influence gender through adolescence and adult life (Bussey & Bandura, 1999). Gender-based behaviours, including gender expression, can be reinforced through the validation of gender conformity, and punishment of non-conformity (e.g., "boys don't cry", "man-up"). Gender identity and its expression can conflict with social norms and expectations. For some, such conflict can threaten self-identity, and contribute to mental health issues.

Summary

A gender approach considers more than simple binary male/female distinctions, and reflects wider psychological and social influences. Approaching gender as a continuous,

multidimensional, set of constructs, allows for greater scope to explore pain in men and women. A starting point would be to consider stereotypical masculinity and femininity, the extent to which men and women identify with these constructs, and how this might affect pain and pain-related behaviours. By viewing gender as a flexible construct that is influenced by social context, we can also start to think of pain behaviours as gendered pain behaviours, and consider whether the interpersonal interactions that occur around pain can partly be viewed within a gender-based context.

The Gender Context Model of Pain

Building on these approaches to gender, the 'gender context model of pain' is proposed (see Figure 1). It assumes that pain can be subject to the same gender-based influences found in other aspects of life. It starts with the premise that pain can be, at least partly, viewed as a (1) socially determined (learnt, constructed), (2), multidimensional, (3) dynamic (flexible), gendered experience that has both (3) intrapersonal (personal and subjective) and (4) interpersonal (situational; social and relational) contextual components. It is also assumed that (5) the wider socio-cultural gender context in which pain occurs can play a role in the way pain is experienced and responded to. From this, pain, and especially the expression of pain, can be affected by the gender context in which it occurs.

The model builds on psychological concepts commonly found in pain, but through a gender lens, incorporating elements of fear avoidance (Vlaeyen & Linton, 2000), pain interruption (Eccleston & Crombez, 1999), self-identity (Karos, Williams, Meulders, & Vlaeyen, 2018), social communication (Craig, 2009) and goal motivation (Van Damme & Crombez, 2018). By placing 'gender context' as a central component, the model not only reflects an individual's personal experience of pain, but also the wider interpersonal context in which pain occurs. The term gender context is therefore used to refer to both the

individual's (internal) gender-based thoughts, feelings and behaviours that may occur during pain, as well as the sex- and gender-based interpersonal interactions people have. Although the model highlights contextual and socially constructed elements, as noted above, biological determinants of pain in men and women are not irrelevant. Indeed, pain has a biological basis, as do psychological processes. However, the focus here is on pain at a psychological and social level; highlighting the role that contextual aspects of sex and gender can have on pain, including how it is expressed and managed.

Six core proposals underpin the gender context model of pain, which in turn can be used to generate predictions as to why, when, and in what way variation in pain occurs.

Figure 1

Proposal 1: Gender identity is central to the gender context of pain

The first assumption is that gender identity can play a central role in the way some individuals perceive and respond to pain (see Figure 1, Path 1). Although self-identity is multifaceted it is argued here that gender identity is a core component for many people, developing from an early age (Bussey & Bandura, 1999). For these individuals, gender identity impacts on the way they view and live their lives. This includes how people perceive and experience their bodies, their health status, as well as how they interact and respond to others. Self-identity is also closely related to pain (Karos et al., 2018; Vlaeyen, Morley, & Crombez, 2016). For example, pain brings a heightened awareness of one's body, and its limitations, which in turn can have profound effects on an individual's sense of self (Tabor et al., 2017). This is clearly seen in those with persistent pain, which can have dramatic life-limiting effects, interfering with people's lives, and preventing them from achieving their

goals – all of which can negatively affect a person's sense of self. The current approach brings these two streams of work together: by arguing that the extent to which a person's identity is linked to gender will affect how they perceive and respond to pain.

The model, as outlined in Figure 1, shows that gender identity, defined either by binary gender categories (e.g., man, woman) or as a set of continuous gender constructs (e.g., masculinity, femininity), can impact on pain experience and behaviour (Path 2). Gender self-identity is related to gender-based beliefs/expectations (Path 1), and includes self-referent comparisons about how men and women should behave when in pain. This also allows for the model to accommodate the different conceptual approaches to gender identity, such as those reflecting self (individual, stable traits) and social (contextually dependent, flexible) identity traditions. Both are potentially relevant to pain, although they may well lead to different predictions and methods of investigation. For example, a social group approach to identity focus on how one positions or affiliates themselves in relation to gender groups, and so would focus more on contextual influences. The view taken here is that whilst individuals possess a relatively stable sense of their own gender identity, its expression is subject to the influence of situational and interpersonal context. Either way, both gender identity, and associated beliefs, are predicted to not only affect how individuals respond to painful events, but also the way they view and respond to the pain of others (Path 7).

Proposal 2: Pain can threaten gender identity and produce gender role conflict

Pain is a fundamental warning sign, signalling that the body is under attack, and so demands immediate attention and an interruption to current tasks (Eccleston & Crombez, 1999). Since pain signals a threat to the (healthy) body, and in turn, the body is embedded within gender identity, then for some, pain can potentially become a threat to gender identity and produce gender-role conflict (Path 3). It is for this reason that the relationship between

gender identity and pain is predicted to be bidirectional; in that gender identity can affect pain, but pain can affect gender identity also. Pain is most likely to threaten gender identity, when it results in long-term conflicts with gender-based values and beliefs, or prevents individuals from being able to achieve gender-based goals or perform gender-based roles (Path 4). Pain can also be considered a threat to an individual's social (gender) roles, as pain interferes with people's ability to perform social tasks. If pain is, in its non-chronic form, adaptive, and serves a protective function, then it is conceivable that pain evokes behaviours that serve a protective function around gender identity also. For some, pain may place people in situations that trigger gendered behaviours, because of concerns around gender role conflict, and how gender is expressed when in pain.

If pain, and its expression, is associated with gender-role conflict, and is considered a threat to gender identity, then there may well be processes that facilitate the detection and interpretation of pain and pain-related cues. If so, those who view pain as a threat to gender-identity are more likely to be vigilant towards pain and more likely to interpret ambiguous signals of pain as negative (Path 5). The extent to which pain affects gender identity depends on the degree of gender-role conflict that being in pain evokes i.e., the greater the perceived role conflict by pain, the greater the sense of threat, and greater the disruptive interference it may have (Paths 3, 4 and 5). Since masculinity and femininity are assumed to co-occur, the nature of gender threat from pain will reflect an individual's relative identification with masculine and feminine roles. Given there are different ways in which gender identity manifests itself (e.g., traditional gender role; gender non-conforming), then the way in which pain is viewed as a threat depends on an individual's representation of gender role identity. If gender-role conflict from pain continues over a sustained period, pain can potentially lead to changes in an individual's gender identity.

Proposal 3: Pain can evoke behavioural responses aimed at reducing gender threat and gender role conflict

Pain-related fear not only evokes increased bodily vigilance/awareness and leads to negative appraisal, but importantly this can also elicit avoidance behaviours (Vlaeyen & Linton, 2000). If pain, and its expression, is interpreted as a threat to gender identity, resulting in gender-role conflict, then pain may also evoke behaviours designed to reduce or avoid such conflict (Path 6). Indeed, it is expected that some individuals will be motivated to engage in protective, threat-reducing, behaviours in an attempt to resolve gender-role conflict and/or restore gender self-identity (Paths 5 and 6). For example, since traditional masculinity is linked to agency, greater threat from pain will be perceived when roles associated with independence and strength are challenged. Responses will reflect attempts to regain or repair masculinity, despite the pain. In contrast, threats to traditional femininity may focus more on the way pain challenges communion, with the greatest distress associated with disruption in fulfilling interpersonal roles, or maintaining social bonds. Behavioural responses to perceived threats will function to preserve femininity, with a focus on the restoration of interpersonal roles. Gender conflict resolution will, therefore, be directed towards establishing a preferred gender role-behaviour equilibrium.

These protective behaviours are also expected to be subject to appraisal processes, and are adopted or rejected based on whether they are considered (gender) appropriate, and/or successful in reducing gender threat (Path 3 and 5). For example, supressing pain may be considered a successful response if this reduces the appearance of being ‘weak’. Such pain behaviours, and the likelihood that they will be repeated, are also influenced by the actual, and perceived, consequences that they have on the individual. Therefore, some pain behaviours are less likely to be adopted, if they violate gender norms, or escalate the perceived threat to gender identity. Since gender-based norms may be different for men and

women, then what constitutes an infringement of such norms, and consequently what may be appraised as appropriate behaviours may be different for men and women. For example, crying might be considered a less appropriate response for men, but more acceptable for women. However, crying might also reinforce negative gender-based stereotypes ("women are emotional"), which in turn may lead to negative consequences. If individuals are unable to escape, or avoid, threats to gender identity, such as in persistent pain, this could lead to increased distress (e.g., depression, anxiety) and contribute to pain-related disability.

Proposal 4: The interpersonal context of pain can also be considered a gender context

The wider social (interpersonal) context of pain can also be considered a gender context (Bernardes et al., 2008; Keogh, 2014, 2018). At basic level this can be viewed within the interpersonal interactions that occur between men and women. However, a gender approach also allows us to go beyond binary (male/female) dyadic interactions. For example, some environments where pain occurs could be perceived as stereotypically masculine, and are likely to promote agency and reduce the likelihood of pain expression (e.g., competitive sports, some work settings). In contrast, environments considered more stereotypically feminine (e.g., support groups, caring settings), might be expected to promote collaborative behaviours, and so be more accepting of social support, and expressions of vulnerability around pain. The interpersonal social exchanges that occur within these environments can also be affected by gender constructs, and trigger gendered behaviours (Path 7).

Both those in pain, and observers, bring their own gender identity, gender-related beliefs and expectations. These can impact on how they both appraise the social context, and how they interact with others (Paths 1, 2, and 7). Social interactions are transactional and can depend on the nature of relationship between individuals (e.g., stranger, friend, romantic partner). The gender context can therefore affect the way in which interpersonal interactions

around pain occur, both positively and negatively. This context can be threatening, and has the potential to produce gender-role conflict, especially if there is a perceived inconsistency between an individual's gender beliefs and their social environment. The interpersonal gender context is also motivational -- affecting observer's pain behaviours, by eliciting actions designed to reduce gender-role conflict and gender threat (Path 5, 6 and 7). This may result in an increase or decrease in pain behaviours in both those in pain (e.g., support seeking), and those observing people in pain (e.g., provision/withdrawal of support). Some pain responses maybe considered more 'acceptable' or 'unacceptable' depending on the interpersonal gender context, with some behaviours being negatively viewed by others, and even punished. Just as pain behaviours can have positive or negative social consequences that affect whether they are repeated or not, we can think of gender-based pain behaviours in a similar way.

However, this is complex, and how such behaviours are responded to depends on the relational and situational context (e.g., social group, closeness). For example, in some cases, acting in a way that is inconsistent with gender roles may be positively reinforced by others e.g., a man who is typically stoic, is encouraged to seek help when in pain. Similarly, acting consistently with gender roles way may result in punishing behaviour e.g., women presenting in a stereotypical manner (e.g., distress, expressive) may be viewed as less credible (Schafer, Prkachin, Kaseweter, & Williams, 2016). Either way, the actions and responses of others, especially family members (e.g., spouse, parents), acquaintances and friends, are thought to play a key role in shaping future gender-related pain behaviours.

Proposal 5: The gender context of pain can be multifaceted, dynamic and flexible

Given that both gender constructs and social environments can be dynamic and changeable, then a gender context approach to pain also needs to reflect this flexibility. Whilst individuals can bring gender to social exchanges around pain, how this affects pain

behaviour can be situationally dependent (Path 7 and 8). That is, the gender context of pain can fluctuate, reflecting situational changes in the social environment. This is because interpersonal interactions around pain are dynamic, evolving through a series of negotiated social transactions. This can at times require individuals to modify their pain behaviours accordingly. Similarly, different pain and relational contexts are likely to see variation in the extent to which the external, observable, manifestation of gender is presented to others. Therefore, in the same way as individuals 'do' gender, comprising a set of continuous negotiated social transactions that can be rewarded or published, individuals can 'do gendered pain' as well. This means that individuals have the capacity to display or perform different (multiple) versions of masculinity and femininity around pain, which depends on the situation people find themselves in.

Proposal 6: The gender context of pain can be socially constructed (learnt) and reflects the dominant cultural ideology of the time

The final proposal is that the gender context of pain can be socially constructed, and partly reflects dominate cultural aspects of what is considered to be appropriately masculine (for men) and feminine (for women) pain behaviours (Path 8). Gender identity, gender-based beliefs and behaviours around pain, form in early childhood through social modelling. Gender-based pain behaviours develop alongside the general development of gender and gender identity, including conceptualisations of the gendered body, attitudes to health and health-related behaviours. This also includes the development of gender stereotypes around appropriate gender-based pain behaviours (both as someone in pain, and when observing others in pain). It is possible therefore that some pain behaviours, are generated by, and serve to reinforce, existing views about what is a socially acceptable. However, what is considered an acceptable gender-based pain behaviour varies across situations, cultures, and time frames. While gender-based pain beliefs and behaviours become established in early childhood, they

evolve through adolescence and adult life. For example, an individual's position within a family changes according to life stage (e.g., child, adolescent, parent/carer), as can expectations around gender-based roles. Dominant ideologies around gender will be linked to how cultures generally view pain and suffering, and influences how this should be managed, both individually, and by social institutions, including healthcare systems. The gender context of pain can, therefore, operates at a wider socio-political level, reflected in health priorities, and influencing the way in which pain and gender health issues, more generally, are managed, researched and funded. This includes gender-based health provision for pain, and related gender health inequalities in pain provision for men and women.

Testing the Gender Context Model of Pain

An immediate benefit gained from the gender context model of pain is that it enables the development of new research questions, and formulation of testable predictions. These questions can be explored empirically by designing new studies to test specific hypothesis. However, the model can also be used to provide a basis from which to structure, appraise and make sense of the existing literature around sex, gender and pain. Such an appraisal is a good first step in the test of a model, and also enables the identification of gaps in knowledge, and points to directions for future investigations. A set of primary research questions, and related secondary questions have been generated from the new model, which can be used to structure and explore the existing literature around men and women's pain. Within each, predictions based on the model are introduced. These questions, predictions, and accompanying evidence, will be split into two sections, which are broadly based on the two levels of analysis that have informed the model (Bernardes et al., 2008): the first section focuses on questions generated at the individual (intrapersonal) level, whereas the second part appraises those generated at the interpersonal level. Since the intrapersonal aspect of the model is better

specified, predictions at this level of more focused. Whilst this structure helps organise the review, some evidence could apply to either level, and there is a certain degree of overlap.

Part 1: The Intrapersonal Gender Context

Question 1. Is gender identity related to pain and pain-related behaviours?

Rationale/predictions: The gender context model of pain places gender identity at the centre (Proposal 1). Masculine and feminine identity are predicted to impact on both pain and pain-related behaviours (Path 2). Those who identify as traditionally masculine (e.g., independent, stoic/unemotional) are less likely to report and display pain to others, whereas those identifying as feminine (e.g., emotional; supportive/nurturing) will be more willing to report pain and seek help. Both gender trait and self-categorisation approaches have been used to explore gender identity and pain. Whilst the trait approach suggests a relatively stable relationship, social group approaches suggests it is more flexible and contextually dependent.

Are gender traits related to pain experience? A number of studies have utilised experimental pain induction protocols with healthy individuals and explored how measures of pain sensitivity (typically pain threshold and/or tolerance) relate to gender traits (Alabas, Tashani, Tabasam, & Johnson, 2012; Dixon, Thorn, & Ward, 2004; Martin, 2019; Myers et al., 2006; Otto & Dougher, 1985). Some report a stronger relationship between pain sensitivity and masculine traits, especially in men. For example, Otto and Dougher (1985) found men with a strong masculine traits had higher pain thresholds compared to men low in masculinity, or women. However, other studies reports that feminine traits may be more important for pain than masculinity, whereas others suggest these gender traits do not have a role (Fillingim, Edwards, & Powell, 1999; Kroner-Herwig, Gassmann, Tromsdorf, & Zahrend, 2012). To help make sense of such mixed findings, a meta-analysis of six studies (406 males; 539 female) was conducted by Alabas et al. (2012), which explored the

relationship between masculine and feminine traits and pain threshold and tolerance. An overall correlation was found, indicating that more masculine and less feminine traits are associated with higher pain threshold and tolerance. However, the size of effect was small (r = .17), and a high degree of heterogeneity found. Unfortunately, moderators were not considered, and so it is not possible to determine whether the patterns found were stronger within men or women. Part of discrepancy in findings might be due to different measures of gender trait being used. Interestingly, there may be a potential, unintended, gender bias associated with recruitment into some experimental pain studies. Men who identified with masculine, but not feminine roles, were more willing participate in an experimental pain study (Feijo et al., 2018).

Gender traits have also been explored in clinical settings. Again, self-report measures of gender and pain are used, often exploring correlations between constructs. One study found higher masculine traits were related to less self-reported disability in men and women with arthritis (Trudeau, Danoff-Burg, Revenson, & Paget, 2003), and another that higher femininity was related to a greater number of reported pain conditions (in men, not women) (Applegate et al., 2005). Other patterns are reported (Berghuis, Heiman, Rothman, & Berger, 1996; Fillingim et al., 1999). For example, Berghuis et al. (1996) found men with chronic prostatitis reported lower self-reported masculinity compared to pain free controls, but no differences in femininity. In addition, Fillingim et al. (1999) found that men and women high in pain (defined as above/below median number of pain episodes) reported higher femininity, but similar masculinity scores. They also found the expected sex difference in thermal pain threshold and tolerance (women were more sensitive), but interesting this remained significant even when controlling for gender traits. Taken together, whilst some evidence supports predictions about gender traits and pain, there is variation in patterns found.

How flexible is the relationship between gender identity and pain? An alternative to gender traits is to consider gender-identity from a self-categorisation approach. Whilst fewer studies have been conducted, there are suggestions that a more flexible approach to gender identity is also related to pain (Martin, 2019; Myers et al., 2006; Pool, Schwegler, Theodore, & Fuchs, 2007). For example, Pool et al. (2009) used a self-categorisation task to determine traditional gender identification. They found that men who reported high identification with traditional male roles had a greater tolerance to pain when compared to women who identified with traditional female roles. Men and women who did not possess such views were not found to differ in their sensitivity to pain. In their meta-analysis, Alabas et al. (2012) also found group membership is relevant. They found that participants who believed they were less sensitive than the typical women showed a higher threshold and tolerance to experimental pain.

Other approaches also support the view that the individual gender context can flexibly affect pain. For example, some experimentally manipulate the context, and/or information about gender roles and norms, to see if this impacts on pain (Fillingim, Browning, Powell, & Wright, 2002; Fowler, Rasinski, Geers, Helfer, & France, 2011; Pronina & Rule, 2014; Robinson, Gagnon, Riley, & Price, 2003). When asked to recall feminine behaviours, Fowler et al. (2011) found that men subsequently reported less pain than women, whereas when in a masculine recall condition, no difference was found. This approach also suggests that gender identity can be flexible, and that situational factors can affect the way men express pain, although this seems less so in women. Unfortunately, few clinical studies take this approach, and it is unclear how generalisable this effect is to chronic pain.

Only one study has combined trait and situational (state) aspects of gender and look at how they affect experimental pain. Martin (2019) measured gender traits, and included a gender priming task within cold pressor task instructions i.e., either men or women performed

better on the task, or there is no difference. Although both men and women who rated themselves as high in masculinity exhibited the highest pain thresholds, this depended on the type of prime. For masculine men, the female prime led to higher pain thresholds, whereas for masculine women it was the male prime that produced this effect. This suggests that gender traits may interact with situational factors, and manifest in different ways amongst men and women. It also suggests that although trait and situational approaches to gender identity are often presented as alternative approaches, they can be explored together.

Is gender identity related to support seeking and pain expression behaviours?

Unfortunately, few studies have directly investigated whether gender identity is related to pain behaviours, including expressions of pain. Most investigations have considered binary differences between men and women, and so only provide indirect support for gender constructs. For example, women are more likely to seek help and use social support for pain, while men seem reluctant to seek help (Keogh, 2015; Wang, Hunt, Nazareth, Freemantle, & Petersen, 2013). Interpersonal verbal transactions around pain also seem to benefit women. For example, women's pain sensitivity levels are found to decrease following verbal transactions about pain, and increase when asked to cope alone (Jackson, 2007; Jackson, Iezzi, Chen, Ebnet, & Eglitis, 2005). Another approach has been to consider the language used to describe pain. Women are found to use more pain words during a painful event, or when describing a painful episodes (Jackson, Huang, Chen, & Phillips, 2009; Strong et al., 2009). Women have also been found to focus more on sensory elements of a painful event, whereas men focus on emotions (Strong et al., 2009). Others find differences in pain language used by men and women with chronic conditions. For example, one study found women were more likely to refer to pain, and use a wider range of descriptors when talking about pain e.g., more facts, more psycholgical words (Jaworska & Ryan, 2018). Interestingly, whilst men didn't use as many pain descriptors, when they did, they were more emotional in

nature. Men also avoided reference to psychological aspects of pain, focusing more on analgesics. Whilst differences in men and women's verbal pain expression have been found, there has been less convincing evidence when looking at the encoding of non-verbal expressions of pain (Keogh, 2014). Pain-related facial (e.g., grimacing), vocal (e.g., crying, signing) and body displays (guarding) have been considered, but differences between men and women are not consistently found (Craig, Hyde, & Patrick, 1991; Kunz, Gruber, & Lautenbacher, 2006; Prkachin & Solomon, 2009). Thus, somewhat surprisingly, the lack of research means it is somewhat unclear whether gender identity impacts on pain behaviours.

Appraisal: Gender identity seem to be broadly related to pain, and the evidence that exists supports elements of the gender context model. However, there are also inconsistencies in results that limit stronger conclusions, and which need to be explained. This could be due to the way gender identity is conceptualised (e.g., trait measures vs. self-categorisation), or due to the type of pain studied (experimental vs. clinical). There are also numerous gaps in research, especially around gender, pain expression and help seeking. Most expression studies are limited to binary comparisons between men and women, and do not take gender constructs into consideration. More studies have taken a trait approach to gender identity and pain, but even here there are inconsistencies. A minority of studies have considered gender from a social group perspective. This signals a missed opportunity, as these alternative approaches to gender identity allow for the formation of different questions, and use of different methods (Wood & Eagly, 2015). There is also a potential issue around measurement. For example, there is an overreliance on somewhat dated measures of gender trait identity, and so when designing measurement tools there need to be checks to prevent content overlap, which risk exaggerating associations e.g., gender traits around being emotionally expressive and measures of pain expression (Lauwerier et al., 2015).

Question 2: Does pain result in gender-role conflict? If so, does gender-role conflict affect pain behaviour and gender identity also?

Rationale/predictions: The flexible approach to gender identity (Proposal 5), enables a bidirectional association with pain (Paths 2 and 3). A flexible approach is proposed because pain can result in gender role conflict, which can threaten, and in some cases could impact on gender identity as well (Proposal 2). Gender conflict is expected to occur when gender identity, and associated beliefs and expectations, do not align with experience (Path 5). Gender threat will be characterised by increased vigilance for pain cues, and can motivate individuals to adopt strategies designed to reduce such conflict. Challenges to gender identity and associated roles can lead to changes in the way pain is expressed and responded to (Path 6). However, when pain is chronic, prolonged gender conflict can eventually affect gender identity itself (Paths 3 and 4).

Does pain produce gender role conflict/threat, and does this in turn impact on gender identity? Whilst there is evidence that chronic pain generally affects self-identity (Vlaeyen et al., 2016), few empirical studies directly explore whether pain produces gender-role conflict, which in turn affects gender identity. Few experimental studies have explored whether induced pain affects gender expression, or group affiliation. Furthermore, no prospective clinical investigations have explored whether the development of chronic painful conditions affects and changes gender identity over time. There are, however, studies that provide indirect support. These investigations consider the lived experience of those with persistent pain, and explore whether pain produces gender-role conflict, and/or affects gender identity. Gender-related themes are explored within specific clinical conditions that effect either men (e.g., prostate cancer) or women (e.g., dysmenorrhea).

Consistent with predictions, men report conflicts with traditional stereotypical masculine views, such as stoicism, as well as a loss of independence and ability to fulfil (male) roles e.g., provide for family (Tannenbaum & Frank, 2011). A common theme that emerges is how pain can have a demasculinising effect, especially amongst men with strong stereotypical ideals, and/or for conditions, such a prostate cancer, where issues around sexual functioning are an issue (Ahlsen, Bondevik, Mengshoel, & Solbraekke, 2014; Chambers, Chung, Wittert, & Hyde, 2017). The coping responses adopted by men in response to gender role threat are also positioned around a need to reinstate masculinity identity, using stereotypical coping approaches (Ahlsen, Mengshoel, & Solbraekke, 2012a, 2012b; Flurey et al., 2016; Flurey et al., 2018). For example, some find men report preferring to find solutions within healthcare for their painful condition, rather than focus on the emotional consequences of pain (Ahlsen et al., 2014; Ahlsen et al., 2012b). Alternatively, some men renegotiate traditional male roles. For example, Flurey et al. (2016) found that while some men felt a need to live up to the stereotypical masculine ideal of being strong, others were more accepting and adapted to the pain. These findings are not only consistent with predictions that pain threatens gender, but also points to multiple forms of masculinity.

Similar themes emerge when exploring the effect of painful conditions on feminine identity in women. Gender-conflict is usually reported to be around traditional (stereotypical) female roles, with an emphasis on pain preventing women being able to nurture and provided emotional support to others e.g., good mother/spouse (Cote & Coutu, 2010; Johansson, Hamberg, Lindgren, & Westman, 1997; Johansson, Hamberg, Westman, & Lindgren, 1999). For example, Johansson et al. (1997; 1999) found that women with musculoskeletal pain reported their condition negatively affected female self-identity by restricting their ability to balance dual work and family roles. Gender-role conflict has also been reported in terms of the defeminising effect of pain (Ayling & Ussher, 2008; Marriott & Thompson, 2008;

Shallcross, Dickson, Nunns, Mackenzie, & Kiemle, 2018). For example, in a systematic review of vulvodynia, Shallcross et al. (2018) found women reported being "degendered" and "defeminized" by the painful condition, perceiving themselves as less (sexually) desirable to others. There are also examples where women report responding to painful conditions by trying to restore their sense of femininity (Ahlsen et al., 2014; Côté & Cout, 2010).

Does gender-related threat effect pain and pain-related behaviours? Few clinical studies have directly explored whether gender-related threat and gender-role conflict impacts on pain and pain-related behaviours. However, there have been attempts to experimentally manipulate gender threat, and explore what impact this has on responses to induced pain (Lash, Eisler, & Southard, 1995; Lash, Gillespie, Eisler, & Southard, 1991). For example, when Lash et al. (1991) presented instructions specifically designed to threaten masculinity (e.g., highlighting good performance, physical fitness), they found that men, but not women, showed greater cardiovascular reactivity to experimental pain. In a follow-up study, Lash et al. (1995) placed men and women in conditions designed to threaten either masculinity or femininity. Women showed greater cardiovascular reactivity (i.e., systolic blood pressure) to feminine stressors, whereas men responded more to masculine stressors. Others have focused specifically on the effect of gender threat on pain threshold and tolerance measures (Abetkoff, Karlsson, & Chiou, 2015; Berke, Reidy, Miller, & Zeichner, 2017; Fillingim et al., 2002; Martin, 2019). For example, Fillingim et al. (2002) found that male participants had a higher tolerance for pain when they were informed that women were better at controlling pain. This was interpreted by the authors as a threat to masculinity, which seemed to affect men more than women. Another study found that presenting advertisements with high masculine norm stereotypes (i.e., energy drinks with strong masculine identify associations) increased pain tolerance (Abetkoff et al., 2015). Similarly, false feedback designed to threaten masculine identity, has been found to result in higher aggression, greater gender role

discrepancy and higher pain tolerance (Berke et al., 2017). Unfortunately, women were not included in these two studies, and it is unclear whether similar effects would be found for experimental threats to (feminine) gender identity. However, the study by Martin (2019), which was outlined in the previous section, suggests that gender threat affects the pain thresholds of both men and women who report high levels of dispositional masculinity. No study has directly explored what effect gender threat has on nonverbal pain expression.

Does gender threat lead to increased pain vigilance? Few, if any, studies have explored gender threat vigilance and appraisal, and whether they have a motivational influence on subsequent pain behaviours. These aspects of the model therefore remains highly speculative, and untested. Developments in functional motivational approaches to threat detection in pain could be considered within a gender-role conflict resolution framework in future studies (Van Ryckeghem, Noel, Sharpe, Pincus, & Van Damme, 2019).

Appraisal: Clinical studies suggest pain can be a threat to gender identity, and lead to gender-role conflict in both men and women. Interestingly, gender-role conflict can lead some to engage in behaviours that are thought to restore or even reconfigure gender roles. However, these studies are few in number, only provide indirect support, often with small samples, which prevents generalisation. The lack of any longitudinal investigation into the impact that chronic pain has on gender identity is a clear gap in knowledge. Whilst some experimental studies have used direct methods to induce gender-threat/role conflict, few have attempted to challenge feminine roles. Unfortunately, few studies have explored whether gender threat impacts on other pain-related behaviours, including the way pain is expressed and communicated. Similarly, no studies have explored whether gender threat increases pain vigilance, or has motivational qualities. Although the model proposes a bidirectional relationship between gender identity and pain, this is under specified, and there needs to be careful consideration as to when this might occur.

Part 2: The Interpersonal Gender Context

A central theme within the gender context model of pain is that the interpersonal interactions that occur around pain can also be affected by sex and gender (Proposal 4). It suggests that, at one level, the interpersonal context can be considered a gender context that affects how pain is expressed and responded to. The model proposes that those involved in interpersonal interactions with a person in pain are subject to the same internal processes around gender identity, beliefs, norms etc., and in turn these affect how observers interpret and respond to those in pain. The ideal test of these proposals would be to interrogate studies that measure how gender identity, in both the person in pain and observers, affect the dynamic interpersonal interactions that occur around pain. Unfortunately, the vast majority of research that considers the interpersonal gender context of pain does not do this, and instead explores binary male-female differences. This means it is difficult to use existing evidence to directly appraise this aspect of the model, and points to a need to fill this knowledge gap.

There is still merit in exploring the results from these dyadic binary sex difference studies. For example, they provide insights into the different relational and situational contexts that can be used to explore interpersonal interactions around pain. The interpersonal gender context of pain can be explored by looking at binary dyads, which most often comprise of men and women in pain accompanied by either a same or opposite sex observer i.e., female/female; male/male; female/male. Interestingly, in relationship research, these sex-based binary dyadic interactions are sometimes referred to as gendered interactions. This provides a good starting point from which to explore the interpersonal gender context of pain, and to consider whether such studies provide support for the model's key predictions.

This section of the evidence review will therefore explore sex differences in the interpersonal interactions that occur around pain. It will be split into two sections. The first

considers whether sex differences exist in how individuals in pain are affected when others are present. This helps establish a prima facie case for the interpersonal gender context of pain. It will explore such effects in different relational environments (e.g., family, healthcare settings), as these can help provide unique insights into interpersonal interactions, and the consequences they may have. The second section focuses on those who interact with, and observe, those in pain. It will look at whether there are differences in how men and women in pain are viewed and responded to, again across different relational settings. It also considers the evidence that gender beliefs and biases exist, and whether these impact on how observers, including healthcare professions, respond to those in pain. Again, whilst investigations are limited to exploring binary differences between men and women, they do provide a test of elements of the model. As before, a series of research questions generated from the gender context model are presented, and evidence is appraised in light of key predictions.

Question 3: Is there a prima facie case that the interpersonal context of pain can be considered an interpersonal gender context?

Rationale/predictions: The gender context model predicts that a person's experience of pain will be affected by the interpersonal gender context in which it occurs (Proposal 4). Since masculinity is often associated with stoicism, and femininity with emotional openness, situations and interpersonal interactions that are perceived as more stereotypically masculine might therefore be expected to lead to reduce pain expression. Within dyads, it is predicted that when in the presence of others, sex and gender will affect the way pain is expressed, communicated and responded to (Path 2 and 7). For example, women may be expected to seek support for, and express pain to others, whereas men expected to be less expressive, especially when in the presence of others or where the context is perceived to be potential threatening to masculine gender-roles.

Does pain vary according to the interpersonal gender context in which is occurs?

Supporting evidence for the interpersonal gender context of pain can be found in pain induction studies involving dyads, where the sex of both the participant and the experimenter have been considered (Aslaksen, Myrbakk, Hoifodt, & Flaten, 2007; Kallai, Barke, & Voss, 2004). One pattern that emerges is that participant sensitivity to pain is lower (e.g., higher tolerance) when the dyad comprises of individuals of the opposite sex e.g., when a male participant is accompanied by a female experimenter. Some find that this effect occurs for both men and women in pain, whereas others suggest that it might be limited to either men or women. Occasionally no difference is found. One study found that both men and women had a higher tolerance to pain when interacting with male experimenters, compared to either female or trans-female experimenters (Vigil, Rowell, Alcock, & Maestes, 2014).

The relational nature of dyadic interactions around pain have also been explored in men and women, which provide further insights into the interpersonal gender context. Some focus on friend and stranger dyads (Edwards, Eccleston, & Keogh, 2017; Martin et al., 2015; McClelland & McCubbin, 2008). For example, McClelland and McCubbin (2008) found the presence of a same-sex friend resulted in higher cold pressor pain intensity rating in women, but not men. Martin et al. (2015) found that the presence of same-sex strangers resulted in lower cold pressor pain intensity in men. Conversely, in one of the only studies to have compared pain responses in same- and opposite-sex stranger-friend dyads, Edwards et al. (2017) found men were less likely to express pain (higher cold pressor tolerance) when accompanied by a male friend. This highlights that it is not just the presence of a same-sex observer that affects pain, but also the nature of relationship between them.

Relational factors can also be seen in studies of sex differences in social networks around pain (Block, Heathcote, & Heyes, 2018; Engebretsen et al., 2018; Vigil et al., 2013). Vigil (2013) found that women who reported being part of a close social groups had a greater

sensitivity to cold pressor pain. For men the opposite was found, with less established social networks related to greater pain intensity ratings. Social (peers) networks have also been explored in adolescents – a developmental period when social networks are particularly important and impact self-identity. For example, Engebretsen et al. (2018) found a positive relationship in experimental pain tolerance in boys' same-sex friendship dyads, but not amongst dyads that included girls. When Block et al. (2018) looked at the social interactions of schoolchildren during a 3-week expedition, reduced social connections were found amongst boys in pain. This was partly explained by a reduction in the contact boys had with girls, which the authors suggest might reflect attempts to preserve masculinity, by not appearing 'weak' to opposite-sex friendship groups.

Can spousal interactions around pain provide insights into the interpersonal gender context of pain? Research into family environments can also provide valuable insights into the interpersonal gender, and relational, context of pain. Interestingly, most studies focus on opposite-sex couples, and so less is known about interactions in same-sex couples. One approach has been to explore how opposite-sex couples interact when one of them is in pain, and see if differences are found (Edwards et al., 2017; Fillingim, Doleys, Edwards, & Lowery, 2003; Newton-John & Williams, 2006; Smith, Keefe, Caldwell, Romano, & Baucom, 2004). For example, Fillingim et al. (2003) found solicitous partner behaviour was related to more pain and disability in men, and greater interference, opioid usage and lower pain tolerance in women. Using behavioural observation, Smith et al. (2004) found that wives (compared to husbands) engaged in more facilitative actions around their spouses with pain. This might be because women are more likely to detect pain in others, and therefore ready to support. Indeed, when presented various hypothetical scenarios, Newton-John and Williams (2006) found that male spouses detected fewer pain-related situations than female spouses.

Others consider the perceived quality of relationships and support received in the context of pain. For example, higher perceived relationship satisfaction has been associated with lower facial pain responses to a thermal heat in men, but not women (Gagnon, Hadjistavropoulos, & MacNab, 2017). Others have compared estimates of pain and support between spouses (Cano, Johansen, & Geisser, 2004; Newton-John & Williams, 2006). Women seem to be closer in their estimation of their partner's pain. For example, Cano et al. (2004) found that female patients reported greater pain-related disability than their husbands, whereas male patients gave similar estimates as their wives. They also found male patients reported receiving fewer solicitous actions from their wives, compared to estimates provided by their spouse. The authors speculate that this discrepancy might be because men expect their wives to take a more nurturing (feminine) caring role.

Perceptions about the type of support provided by spouses have been explored (Burns, Johnson, Mahoney, Devine, & Pawl, 1996; Burns et al., 2018; Leong, Cano, & Johansent, 2011). Burns et al. (1996) found that negative critical responses from spouses partly explained an association between pain adjustment and anger in men, but not women. Similarly, Leong, Cano, and Johansen (2011) found that perceived critical communication style might particularly affect men in pain, who are found to be more sensitive to invalidating comments. However, others find that spousal criticism during a conversation subsequently had more of an effect on the pain behaviours of women (Burns et al., 2018). This is a potentially interesting line of work that could be developed to consider the way in which gender threat might occur within the interpersonal interactions of couples.

What do child-parent interactions tell us about the development of gender-related pain behaviours? The gender context model assumes that gender-based pain interactions occur in family environments, and shape children's pain, including how pain is expressed to others. The family context of pain can therefore provide insights into the roles that sex and

gender have in early phases of development. Dyadic interactions between family members provide insights into how gender-related pain behaviours might develop, and are maintained. These ideas have been explore by looking at whether mothers and fathers differ in how they view their child's pain (Goodenough et al., 1999; Moon et al., 2008). For example, Goodenough et al. (1999) found that during needle-induced pain, mothers and fathers provided similar pain ratings as their child. However, Moon et al. (2008) found fathers estimated their sons as having more intense responses to cold pressor pain than daughters, whereas no differences were found in mothers. Interestingly, parental behavioural responses to their child's pain may also vary between mothers and fathers (Birnie, Chambers, Chorney, Fernandez, & McGrath, 2016; Goubert, Vervoort, De Ruddere, & Crombez, 2012; Hechler et al., 2011; Moon, Chambers, & McGrath, 2011). For example, Moon et al. (2011) found mothers engaged in more non-symptom-related discussion with their child, and fathers in more criticism. Goubert et al. (2012) found mothers took a more discouraging, dismissive approach than fathers did.

An alternative approach has been to focus on the child in pain, and consider whether boys and girls respond to parental behaviours in different ways. Some find girls are more sensitive to parental influences around pain (Boerner, Chambers, McGrath, LoLordo, & Uher, 2017; Chambers, Craig, & Bennett, 2002). For example, Chambers et al. (2002) found that mothers influenced girl's pain behaviours more than boys. In a second example, Boerner et al. (2017) used a parental modelling approach, and found girls to be more sensitive (higher intensity ratings) to cold pressor pain when viewing an exaggerated pain response displayed by their parents, irrespective of parent sex. Whilst these findings align with predictions that family environments can be gendered, inconsistencies are also reported (Higgins et al., 2015).

Appraisal: Evidence suggests that there is a prima facie case that the interpersonal context of pain could, in part, be considered a gender context. Whilst evidence is largely

based on binary dyadic interactions between men and women, individuals in pain do seem to be affected by those they interact with, and that the gender context plays a potential role. It also suggests that features of the model could be further explored by looking at the dynamic interactions that occur within family settings. However, the reviewed evidence does not reveal a particularly consistent pattern of effects, and there are other limitations. For example, there is a sampling bias, in that spousal studies are often limited to opposite-sex couples, whereas child-parent studies mostly recruit mothers. This means the full consideration of dyadic (binary) sex differences in families is not always possible. Less is known about other family members (grandparents, siblings), and whether sex and gender play a role here also. Few, if any studies, directly explore the role gender-related constructs have within these dyadic interpersonal exchanges. There clearly needs to be a targeted programme of work that explores the role that the gender constructs identified in the model impact on the interpersonal interactions that a person has when they are in pain.

Question 4: Do observers differentially view and respond to men and women's pain?

Rationale/predictions: The model predicts that the gender context can affect how observers view and respond to the pain of others (Proposal 1 and 4; Path 7). For example, someone with strong stereotypical beliefs that men should be stoic would be expected to respond negatively to behaviours that are inconsistent with such beliefs, e.g., a man crying in pain. At a categorical level, observers are also expected to view and respond to men and women's pain expressions in different ways. For example, men who express pain may be viewed as less masculine. It might also be the case that women are more likely to detect, and respond to, pain in others. This section considers the evidence that observers differentially perceive, and respond to, men and women's pain. It also explores whether there are gender-based beliefs around pain, and if such beliefs affect the judgements of those in pain across different situations, including in healthcare settings.

Do observers view men and women's pain in a similar way? There is evidence to suggest that observers detect and recognise men and women's pain expressions in different ways (Hirsh, Alqudah, Stutts, & Robinson, 2008; Keogh, Cheng, & Wang, 2018; Moon et al., 2008; Prkachin, 2005). For example, when viewing video clips of people undergoing a cold pressor task, men were rated as having less pain than women (Robinson & Wise, 2003). They also found that pain was underestimated more by men than women. In other examples, Prkachin (2005) found that in comparison to men, women were more sensitive to another person's nonverbal pain cues, whereas Keogh et al. (2018) found that both men and women attend away from female facial pain expressions, relative to males. Whilst few studies explore pain expression recognition beyond binary sex-based categories, there are suggestions that the gender context might affect pain expression appraisal. For example, stereotypical masculine primes have been found to result in lower ratings of perceived distress to expressions of pain, and that women express greater empathy when viewing pictures of people in pain (Preis & Kroener-Herwig, 2012; Pronina & Rule, 2014).

If sex and gender affect the way observers respond to those in pain, the question is whether this is due to gender-based beliefs and expectations. Empirical studies confirm the existence of stereotypical gender beliefs about pain (Bernardes, Silva, Carvalho, Costa, & Pereira, 2014; Keogh & Boerner, 2020; Keogh & Denford, 2009; Robinson, Gagnon, Dannecker, et al., 2003; Wesolowicz, Clark, Boissoneault, & Robinson, 2018; Wratten, Eccleston, & Keogh, 2019). For example, Robinson et al. (2003) found that women are viewed as more sensitive to pain, and men less willing to report pain to others. Similarly, Wesolowicz et al. (2018) found that dentists and physicians held the view that men were less willing to report pain than women. Keogh and Boerner (2020) found that the typical man is viewed as being more likely to supress pain signals, whereas the typical women is thought to be more likely to express pain through talking and crying. Other stereotypical views also

exist. For example, Bernardes et al. (2014) found stereotypical views about the types of pain experienced by men and women -- reproductive-related pain was associated more with women, and musculoskeletal complaints with men. Stereotypical beliefs also exist about the way in which men and women are thought to cope with pain. Keogh and Denford (2009) found expectations that women catastrophise more than men, and that men use distraction more than women. Wratten et al. (2019) found that some pain coping strategies are considered more masculine (e.g., swearing, alcohol use), whereas other strategies are viewed as more feminine (e.g., crying, social support).

Some studies also find that such stereotypical gender-based beliefs affect how individuals judge the pain of others (Hobara, 2005; Robinson & Wise, 2003; Schafer et al., 2016). For example, different value judgements are placed on men and women when they express pain. Hobara et al. (2005) found that ratings of various behavioural ratings to pain (e.g., crying, talking) were considered more acceptable when made by women than men, whereas Schafer et al. (2016) found that female virtual patients more negatively than males e.g., less pain, greater exaggeration, lower trustworthiness.

If the gender context affects how people view the pain of others, does this translate to healthcare settings? An implication of the gender context of pain is that differences in how men and women's pain is viewed and appraised may affect treatment decisions (Samulowitz, Gremyr, Eriksson, & Hensing, 2018). One approach has been to see whether male and female healthcare professionals differ in how they treat patients (Deepmala, Franz, Aponte, Agrawal, & Jiang, 2013; Safdar et al., 2009; Vigil & Alcock, 2014; Weisse, Sorum, & Dominguez, 2003). For example, in a review of analgesic decisions made by healthcare professionals, Deepmala et al. (2012) suggested that women might be more conservative in their prescription of opioids than men. Male and female physician's might also differ in pain management referral decisions (Bernardes, Costa, & Carvalho, 2013; Vigil et al., 2017). For

example, Bernardes et al. (2013) found that compared to females, male general practitioners focused more on pathology when making referrals for psychological treatments for pain.

An alternative approach is to look at whether the sex of the patient affects pain treatments decisions (Hirsh et al., 2008; Samulowitz et al., 2018; Schafer et al., 2016). Some find women are less likely to receive analgesics, or when they do, are less likely to receive morphine (Chen et al., 2008; Michael, Sporer, & Youngblood, 2007). However, others find women are more likely to receive medication, including analgesics (Raftery, Smithcoggins, & Ghen, 1995). There may also be differences in the advice given around pain, with one study reporting women are more likely to be advised to restrict activity (Safran, Rogers, Tarlov, McHorney, & Ware, 1997). Some experimental studies have presented healthcare professionals with similar pain symptom information, but varied the patient's sex (Bernardes et al., 2013; Hirsh et al., 2008; Pronina & Rule, 2014; Schafer et al., 2016). For example, Hirsch et al., (2008) found virtual female patients were viewed as having more pain and were worse at coping. In a second study, Schafer et al. (2016) found that when viewing virtual patients psychological interventions were more often considered for women, while analgesics were more likely to be suggested for men. In a review of gender-biases, Samulowitz et al. (2018) conclude that women tend to receive less effective pain relief, and are more likely to have a mental health referral for pain. They also highlight a normalisation of men's symptoms, which are assumed to translate to women, which in turn can lead to women's symptoms not being recognised, and appropriately managed e.g., cardiac pain.

Although the focus here is on the way observers view another person's pain, the gender context represents a dynamic exchange between individuals, and so physician decisions can depend on how patients respond and display pain (Green, Wheeler, & LaPorte, 2003). For example, one study found men and women reported higher levels of pain when their carer was female, whereas another study found heart surgery patients reported lower

levels of pain to male assessors, and higher pain to female assessors (Meyer-Friessem, Szalaty, Zahn, & Pogatzki-Zahn, 2019; Vigil & Alcock, 2014).

Appraisal: Like previous sections, this part of the review suggests support for aspects of the gender context model of pain. For example, differences between men and women seem to exist in the way they recognise and respond to the pain of others. There is evidence that gender beliefs exist about men and women's pain, and that these might also affect how the pain in others is appraised and responded to. However, there are also gaps and limitations in what we know, especially since most studies focus on binary sex differences. It is unknown whether gender-based appraisals made by observers directly affect pain response behaviours, and in turn affect the experiences of those pain. The paucity of research that considers different gender constructs, and in particular how these might affect gendered interpersonal interactions, limits conclusions. Few studies explore whether gender-based pain beliefs affect interactions between family members e.g., parent, spouse. No study has considered the development of gender pain beliefs during childhood, and whether they develop at a similar point as other gender-based stereotypes. It is too early to say whether modifying the gender beliefs of healthcare professionals affect pain treatment choices.

Taking Stock and Future Directions

The gender context model of pain not only provides conceptual structure and scaffolding around the existing evidence, but as demonstrated above, helps identify knowledge gaps, and points to new directions for the field of sex, gender and pain. This final section outlines these directions, and considers implications for future research and practice.

Establishing new directions for the investigation of sex, gender and pain

An advantage of the new model is that it sets out some clear directions for the investigation of men and women's pain. It identifies social psychological mechanisms that

might partly help explain variation in pain, and under what circumstances. It enables the generation of research questions, and testable hypothesis, which could be used to direct future investigations. For example, the model predicts that the stronger an individual needs to conform to traditional masculine gender roles, the more likely pain expression will be perceived as a threat, resulting in gender-role conflict and the adoption of behaviours designed to reduce such threats. Future research can test whether pain increases the avoidance of gender role conflict, and stimulates attempts to preserve gender identity. It would be interesting to explore the extent to which pain signals the need for individuals to protect themselves against threats to gender identity.

As well as hypothesis generation, the model highlights knowledge gaps, and so can be used to stimulate new programmes of work. For example, parent-child interactions mostly recruit mothers, whereas spousal interactions tend to focus on opposite-sex couples. Few consider whether gender constructs, such as masculinity and femininity, play a role in dyadic interpersonal exchanges, and whether dynamic transactions around pain are gendered. The more underspecified elements of the model could be refined also. For example, the mechanisms operating within observers (e.g., carers, parents, spouse etc.), or for that matter wider social factors, could be developed further. Similarly, there is a need to better understand the cognitive-motivational factors (e.g., gender identity, gender norms, gender threat detection) that guide observer behaviour. Less is known about how gender intersects with other social groups in the context of pain, or the wider socio-political aspects of gender and pain. Such gaps are not necessarily limitations of the model, however. The strength of models, such as this, lie in their capacity to evolve, through refinement and expansion.

Exploring pain beyond binary gender categories

Whilst a gender approach highlights the social psychological aspects that contribute to differences between men and women's pain, it offers so much more. Gender enables us to consider the psychological and social processes that contribute to the variation pain within men and women also. Gender identity allows us to consider how individuals perceive themselves and their social world, whereas notions that interpersonal transactions around pain are gendered enables different levels of analysis. The multidimensional approach to gender enables us to go beyond binary comparisons between men and women (Hyde et al., 2018). This does not necessarily mean we should stop exploring binary differences around pain, however. Binary differences can be a useful starting point, paving the way for more complex multidimensional ways of thinking. For example, when considering gender stereotypes, the focus is often what is considered typical male and female behaviour. Binary differences partly account for the variation in pain and analgesia, and so should not be dismissed. There is still merit in ensuring that binary differences between men and women are routinely considered in pain trials. This is still not common practice, and it would be a retrograde step to dismiss between-group differences or discourage such comparisons. Systematic biases continue to exist in the recruitment of men and women, and there is a need to ensure male-female comparisons are routinely conducted in pain studies.

Establishing a causal relation between gender and pain

Whilst the evidence presented in this review is consistent with various aspect of the model, the methods used often only provide indirect support, and so limits definite conclusions. For example, many studies are correlational, and/or do not enable the identification of a causal relation between gender constructs and pain. Experimental protocols provide one way of directly testing core predictions, as well being able to control for possible confounds, including recruitment bias. Whilst experimental approaches have been used, they could be extended to systematically explore the effect that gender constructs have on pain.

For example, manipulations of gender context and gender threat could refined, so that they are more conceptually focused around pain, and tailored to an individual's gender identity.

There is a paucity of prospective studies that seek to better understand the relative roles that sex and gender have in predicting pain and related behaviours. Prospective studies, including clinical trials, could be better designed, to incorporate gender constructs. For example, it would be interesting to see whether psychological treatments that promote flexible thinking result in reduced gender-role conflict around pain. Whilst women experience greater pain across the lifespan, this is mostly understood through cross-sectional studies. Little is known about how men and women adapt to and develop pain over time, and new studies are needed to determine whether changes in pain and disability are casually related to gender constructs. Furthermore, gender identity, and self-identity more generally, can change across the life course, and in response to changing social roles. A developmental approach to gender, and adoption of longitudinal designs, could also be used to explore whether the formation of gender identity in childhood and adolescence is affected by pain.

Developing better methods for measuring gender and pain

One way to facilitate a wider approach to sex, gender and pain is to develop better methods for measuring and assessing gender-related constructs. For example, there do not seem to be many examples where contemporary self-report measures of gender identity have been applied to pain (Boerner et al., 2018). Many of the existing scales used to explore gender measure traditional masculine and feminine traits, often developed in the 1970s and 80s. Conceptualisations of gender identity have arguably changed and we need to capture contemporary views, and across different settings. General progress has been made in the development of new generation measures of gender constructs (Thompson & Bennett, 2015), which now needs to be extended to research and clinical pain settings. Since gender covers a

range of phenomena (identity, norms/expectations, interpersonal interactions), exploring ways to capture these different elements is required. There is also the need to be clear about what is meant by gender; using terms in a more precise and consistent way, as well as employing appropriate measures that best reflect the aspects of gender under consideration.

Similarly, better methods are needed for measuring pain as a gendered behaviour, including ways to capture the dynamic interpersonal interactions around pain. Most studies to date explore gendered interactions by looking within same- or opposite-sex dyads, but do not examine more complex dynamic interpersonal pain behaviours. A focus on language, as well as nonverbal expression communication, could be used to explore such gendered interactions. Approaches used within relationship science could also be applied more to the investigating of interpersonal pain behaviours (Gates & Liu, 2016; Graber, Laurenceau, & Carver, 2011). For example, multilevel modelling could be used to explore within-person processes, as well as between-group differences. Similarly, mixed-method approaches, where self-report and diary approaches are combined with an analysis of observable pain behaviours, could be used to explore gendered interactions over time (Graber et al., 2011).

Integrating biological and social psychological approaches

Just as biological, psychological and social mechanisms are essential ingredients in how pain is conceptualised, understood and managed, their interaction may also help understanding the variation in pain amongst men and women. Better methods are also required to investigate potential interactions between these mechanisms. This is not an issue limited to pain, and those working in gender research, are also exploring ways to better integrate biological and social influences (Berenbaum, Blakemore, & Beltz, 2011; Holmes & Monks, 2019; Polderman et al., 2018). Biology raises issues (e.g., sex hormones) that can help inform those interested in social influences, whereas social approaches (e.g.,

environment, context) informs those interested in biological influences. Given the relative success pain researchers have had in taking an interdisciplinary approach, a focus on pain may have wider benefits to those generally interested in gender. For example, puberty is not only a time where male-female differences in pain emerge, but also reflects hormonally-mediated physical maturation, changes in self-identity and social group relationships, as well as increased independence, including health and healthcare choices. Developing methods that enable the discovery of how hormonally-mediated changes in the body, and developing gender self-identity, are related, could give valuable insights into the way in such mechanisms interact to influence pain and pain-related behaviours.

Embedding gender within pain interventions

Finally, a key implication from taking a sex and gender approach is to consider whether different treatment approaches are needed to manage men and women's pain. It is too early to give recommendations, as it is unclear which pain treatments 'work better' for men and women. Clinical trials do not routinely consider such differences, and it is rare for meta-analysis of pain interventions to explore for such differences (Boerner, Eccleston, et al., 2017). Despite these limitations, it is interesting to speculate what a gender-based approach to pain treatment might entail. For example, if expressing pain and vulnerability to others results in avoidance of help seeking, or the adoption of less helpful strategies, then targeting such beliefs might open individuals up to adopting more adaptive behaviours. Similarly, if there are concerns around being able to fulfil multiple roles whilst dealing with a persistent painful condition, then finding ways to share such roles, could be beneficial. There are examples where traditional expectations around support seeking are targeted, and it would be interesting to see whether this could be applied to pain. There are also approaches around supporting partners to help couples positively manage pain, and these could be adapted to address gender expectations. A gender approach also highlights inequalities around pain, and

the way gender expectations and biases affect treatment decisions. This points to the need for health institutions, funders and health policy makers to take a gender approach to pain.

Conclusions

There is a need to understand the variation in the pain experiences of men and women. Progress has been made identifying biological mechanisms, yet a dedicated social psychological model of pain is missing. A new model of gender and pain has been proposed, which not only provides a conceptual framework, but also enables the development of testable hypothesis to help understand why, and in what way, pain varies in men and women. The model sets out a roadmap for future research on sex, gender and pain. The goal is to understand the role that sex and gender have in pain, and ensure pain is effectively managed.

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Figure 1. The gender context model of pain